Course Title: Material Science
Course Code: Phy 309
Allowed time: Two hours
Date of exam: 2/1/2016

Damanhour university
Faculty of science
Physics department

Answer the following questions

Question 1: (25 Points)

1. Atomic radius, crystal structure, electronegativity and the valence for several elements are tabled below:

Element	Atomic radius(nm)	Crystal structure	electronegativity	valence
Ni	0.1246	FCC	1.8	+2
C	0.071	FCC	-	-
Al	0.1431	FCC	1.5	+3
Co	0.1253	HCP	1.8	+2
Cr	0.1249	BCC	1.6	+3
Pt	0.1387	FCC	2.2	+2

Which of these elements would you expect to form the following with nickel (Ni), discuss your choice?

- A substitution solid solution
- An interstitial solid solution

2. Suggest the reasons;

a. Number of vacancy increase as the temperature increase.

b. For engineering design, the yield strength is more important than tensile strength.

c. The energy of self-interstitial formation is 3 times larger as compared to vacancy.

3. Define the material science and engineering.

Question 2: (20 Points)

1. Prove that, the weight percent of one element C_1 , is given by the following expression:

$$C_1 = \frac{100}{1 + \frac{N_A \rho_2}{N_1 A_1} - \frac{\rho_2}{\rho_1}}$$

باقى الاسئلة فى الخلف

Where, ρ_1 and ρ_2 are the densities of the two elements

A_1 and A_2 are the atomic weights of the two elements

2. a. Cite two reasons why interstitial diffusion is normally more rapid than vacancy diffusion. b. what is the driving force for steady state diffusion.
3. What is the composition, in atom percent, of an alloy that consists of 33 g copper and 47 g zinc. The atomic weights of Cu and Zn are 63.5 g/mole and 65.4 g/mole, respectively.

Question 3: (25 Points)

1. A cylindrical rod 500 mm long and having a diameter of 12.7 mm is to be deformed using a tensile load of 29000 N. If the rod is to experience an elongation of more than 1.3 mm. Of the materials listed below, which are possible candidates? Justify your choice(s).

material	Modulus of elasticity (GPa)	Yield strength (MPa)
Aluminium	70	255
Brass	100	345
Copper	110	210
Steel	207	450

2. Compare between each two from the following (Justify your answer with drawing)

a. Elastic deformation and plastic deformation.

b. Grain boundaries and twin boundaries.

c. Brittle and ductile material.

3. Discuss the stress-strain behavior for steel.

With my best wishes

Dr. Douaa Bakeer

Damanhour University
Faculty of Science
Physics Department

Examinar name: - prof. Dr. Hussein Motaweh, Dr. Naglaa Roushdy
Date of exam: - 03 / 01 / 2016 Total degree =70 (2015-2016) Allowed time: 2h

(phy201) Subject name: Electrodynamics and Relativity (Physics/Chemistry or physics/ mathematics) for second year students.

Answer the following question (35Mark)

First question (15Mark)

a) Chose the correct answer:

1- The Michelson-Morley experiment show that
(Constant speed of light –Absolute absence –Ether medium absence)
2- The second special relativity theory hypotheses show
(Constant speed of light –Absolute absence - Ether medium existence)
3- Special relativity theory named the fourth dimension theory due to
(Null result – time delay – introduce the time as additional dimension)
4- According to relative theory the relative length is --------than the proper length.
(Larger – smaller – equal)
5- The Michelson-Morley experiment show --------result.
(Positive- null- the change in interference fringes)

b) The train with velocity 0.8c passed in front of an observer on train station. The observer found that the length of train quay equal 60 m and observer also the train front on the quay front and the train back at the quay back?

a) What is the time require the train to pass through a fixed point on quay relative to the observer at quay?
b) What is the proper length of train relative to the observer inside the train?
c) What is the proper length of quay relative to the observer inside the train?
d) What is the time for passing the train a fixed point at quay measured by observer inside the train?
e) The observer inside the train found that the front and the back of the train don't reach the front and back of quay at the same moment find the period of time between the front and the back of the train reach the front and back quay?

Second question (10Mark)

a) Deduce the relative Doppler effect?

b) One physicist at traffic court said that the reason of movement at red traffic (6000 angstrom) is Doppler effect that makes him to see the red color as green light due to its movement with high speed. What is the velocity of that physicist?

Third question (10Mark)

a) Deduce the mass and energy equivalence relation?

b) What are the velocity v and the momentum of electron? (If Eo=0.511Mev, Ek=10Mev)

Good Luck

Dr/ Naglaa Roushdy Mohamed

Damanhour University

Faculty of Science

Physics Department

Examinar name: - Dr.Yasser khedr

date of exam: -28/12 / 2015

1st Term (2015-2016)

Subject name (code): Thyemodynamic

Time of exam: 2hr

Answer the following question (Total degree 35)

part I:- define of the following: **(6 degree)**

1- Specific heat at constant volume
2- Open system
3- Closed system

Part II:- Write short notes about. **(10 degree)**

1- First law of thermodynamic
2- Zeroth law of thermodynamic.

Part III: - solve the problems. **(10 degree)**

1- In part *a*, the system gains 1500J of heat and 2200J of work is done by the system on its surroundings.
In part *b*, the system also gains 1500J of heat, but 2200J of work is done on the system. In each case, determine the change in internal energy of the system.
2- An automobile engine has an efficiency of 22.0% and produces 2510 J of work. How much heat is rejected by the engine?

Part IV: - Derive the work done and change in internal energy at adiabatic processes. **(9 degree)**

Good luck

Damnhour University
Faculty of Science
Physics Department

Frist Term: Jan 2016
Time Allowed: 2 hrs

Second Year Exam. (Physics) Thermodynamics and

Statistical physics

Statistical physics Answer ALL Questions:

1.

a- Show what we meant by:

microstate- macrostate- priori assumption

b- By considering 2 systems with entropy S1 and S2 and

disorder number Ω1and Ω2. Deduce the relation between the total

entropy S = S1 + S2 and the total disorder

number Ω=Ω1Ω2.

2. Using a full mathematical treatment deduce the most

probable macro state for Bose -Einstein Distribution.

Department: Physics
4th Level Students 1st Term
Course Code: *Phy 203*

Date: 29 /12/2015
Time Allowed: 2 hours
Total points: 100

Course Title: *Modern Physics & Atomic Physics & Radiation Physics*
Dr: Abdel Hamed Sakr

Answer three questions only:

1. a)How did Thomson measure the ratio e/m ? What did he conclude from the results obtained ?

   b) Deduce Plank's constant using Einstein's photo electric equations ?

2. Distinguish the difference between alpha, beta, and gamma decay?

3. Give brief account on:
   - Compton effect
   - Nuclear Binding Energy
   - Interaction of Radiation with Matter

4. a) Explain the production and spectrum of x-rays?

   b) - The photoelectric work function of potassium is 2 eV. If light of wavelength $3600A^{\circ}$ falls on the surface of Potassum. Find :
      i. the stopping potential .
      ii. the K.E of electrons in eV.
      iii. The velocity of these electrons.

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With my best wishes

Dr. Douaa Bakeer

Damnhour University

First Term: January 2016
Time Allowed: 2 hrs

Faculty of Science
Physics Department

Third Year Exam. (Major-Physics) in Quantum Physics

Answer **All** Questions :

1-

a) Verify that the continuity conditions of the wave function require that the wave function and its first derivative to be continuous over the interval from – infinity to + infinity even if the potential is may be discontinuous.

b) Establish the mathematical formula for Schrödinger equation and then by using a full mathematical treatment obtain the mathematical expression for equation of continuity

2-

a) Show what we meant by Hermitian operator , then prove that its eigen values are real .

b) Prove that $\left[x^n, p_x\right] = \frac{h}{2\pi i} n x^{n-1}$.

3-

A particle of energy E incident on a one dimensional potential barrier $V(x) = V_O$. Deduce an expressions for both of the transmission and reflection factors for $E > V_O$.

4-

In Bohr model of Hydrogen atom, if both of the nucleus and electron are rotating around a common center of mass with the same angular velocity. Using Bohr quantization assumptions, deduce an expression for the wave number.

Damanhour University
Examinar name: -Prof. Dr.Moustafa M. Mohamed
Date of exam: - / / Total degree = 70 (2015/2016)
(phy403) Subject name: Laser and its applications

Faculty of Science
Physics Department
Allowed time: 2hr
Fourth year students.

Answer the following question (70Mark)

Question I. **(10 mark)**

a- **Choose:-**

1- Coherent means:-
   - Parallel beam
   - Concentrated light
   - Waves in phase
   - All of the above

2- Collimated means:-
   - Parallel beam
   - Concentrated light
   - Waves in phase
   - Single wavelength

3- Heat By Laser causes:-
   - Protein Denaturation
   - Coagulation
   - Vaporization and ablation
   - All of the above

4- Photo-Dissociation means:
   - Destroy the target
   - Break molecular bond
   - Breaks mineralized deposits

5- To generate laser beam three processes must be satisfied:-
   - Population inversion, Stimulated emission, Pumping source
   - Population inversion, Pumping source, and spontaneous emission
   - Stimulated emission, spontaneous emission, and medium
   - Population inversion, Stimulated emission, and medium

Define:

1- Spontaneous emission
2- Stimulated emission
3- Laser tissue interaction
4- Population inversion
5- Doppler shift

Question II. Complete:- **(20 Mark)**

1- To generate laser beam three processes must be satisfied:-
   a. ----------
   b. ----------
   c. ----------
2- *Optical pumping:* suitable for ---------- and ---------- because they have ----------, while *Electric pumping:* suitable for ---------- because they have ---------- ----------
3- Lasers are classified according to laser active medium into:
   a. ----------*:* for example : ----------
   b. ----------*:* for example (----------).
   c. ----------*:* for examples----------
4- Characteristics of laser beam:-
   a. ----------
   b. ----------
   c. ----------
   d. ----------
5- Several factor have to be consider in designing a diagnostic laser system:
   a. ----------
   b. ----------
   c. ----------
   d. ----------

Question III.: write short essay about-: **(15 mark)**

a. Photodynamic Therapy of Cancer
b. laser Doppler velocimeter

Question IV. **(15 mark)**

1- Compare Photocoagulation of retina with Xenon lamp and with laser.
2- Classified LASER according to the hazard.

Question V:- Write essay in one of the following subjects:(10 mark)

1- Industrial Applications of Laser
2- Environmental Applications of Laser
3- Laser induced fluorescence and its applications.

With My Best Wishes

Prof. Dr. Moustafa M. Mohamed